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Appendix F.1 – Construction phase – TUFLOW FV modelling

Results from the TUFLOW FV modelling of construction scenarios are presented in Figure 1 to Figure 9 for each of salinity, DO, TN, TP and TSS. As shown, there is now discernible change between baseline and construction scenarios across all sites (i.e. lines overlay each other) (Water Technology 2025).

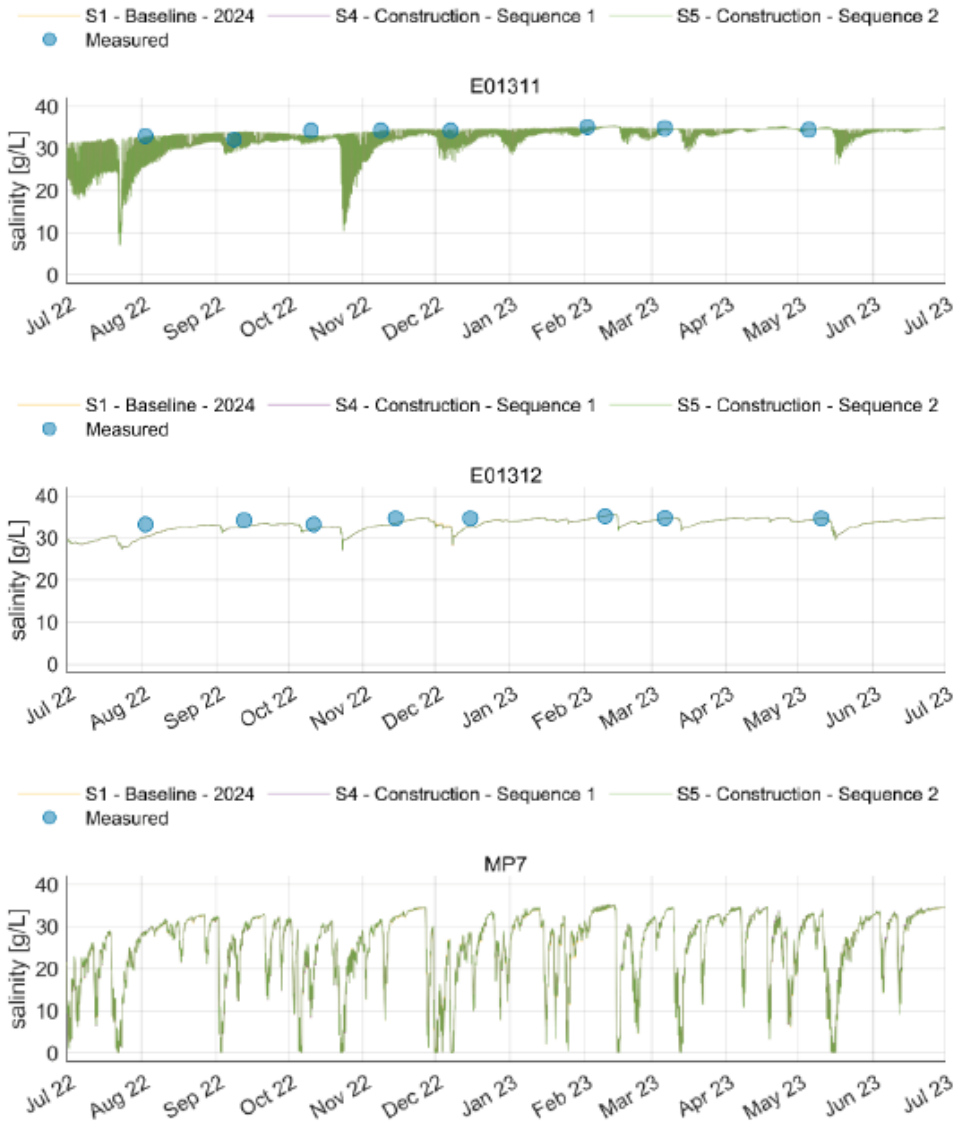

Figure 4-4 Salinity comparison timeseries plots for Construction Scenarios

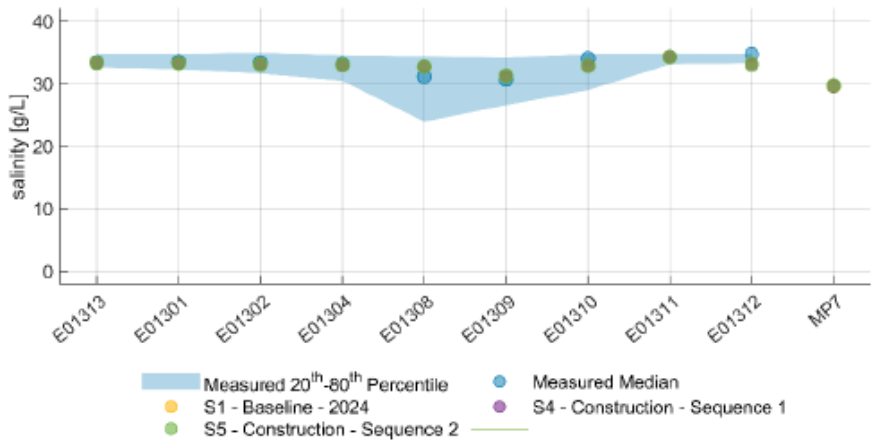

Figure 1 Salinity comparison band plot for construction scenarios

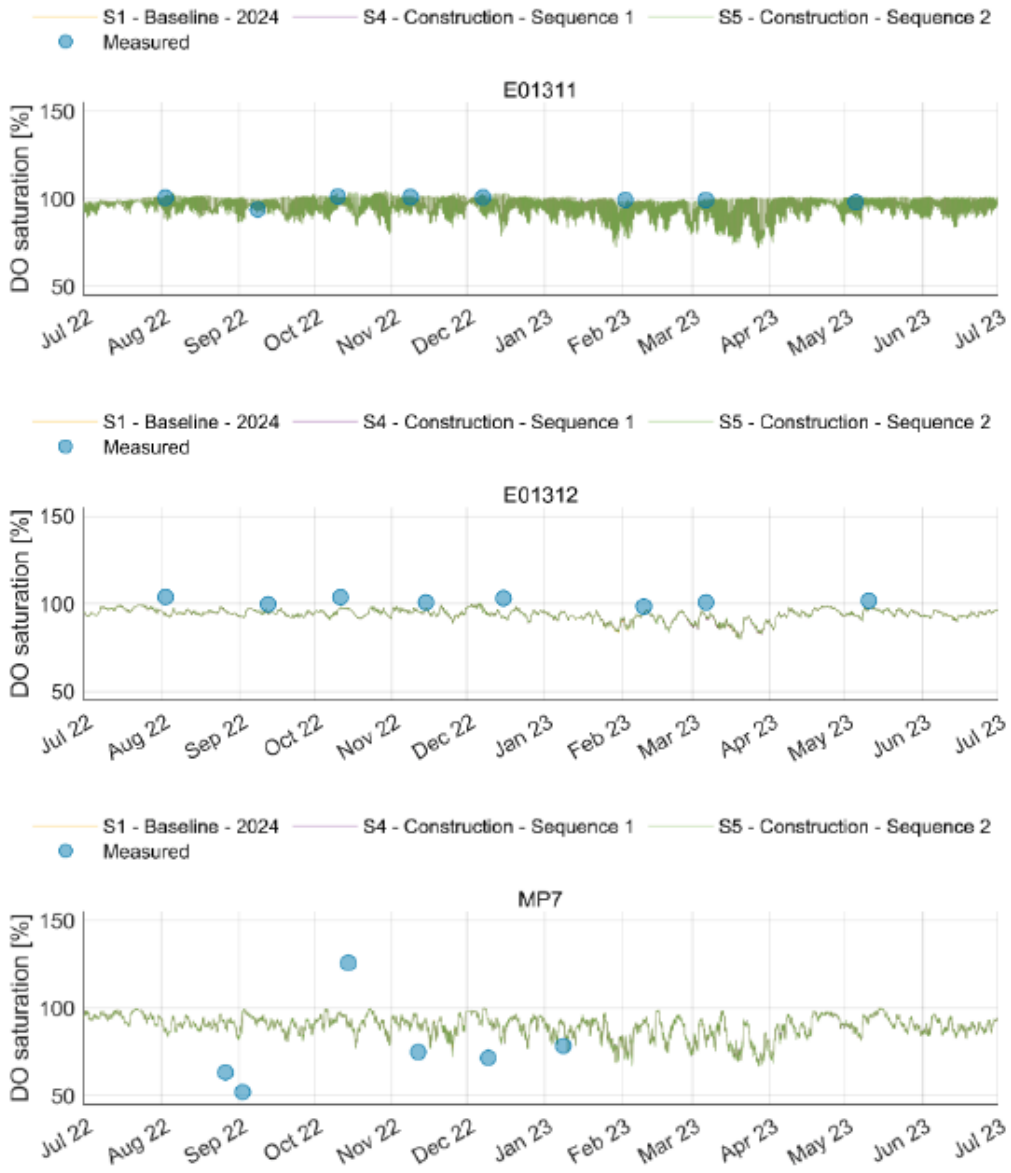

Figure 2 Dissolved oxygen comparison timeseries plots for construction scenarios

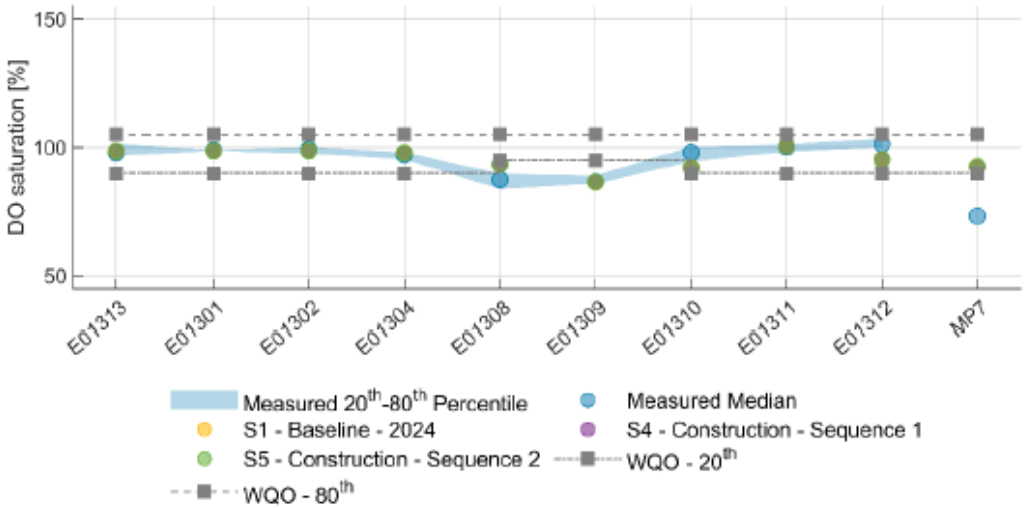

Figure 3 Dissolved oxygen comparison band plot for construction scenarios

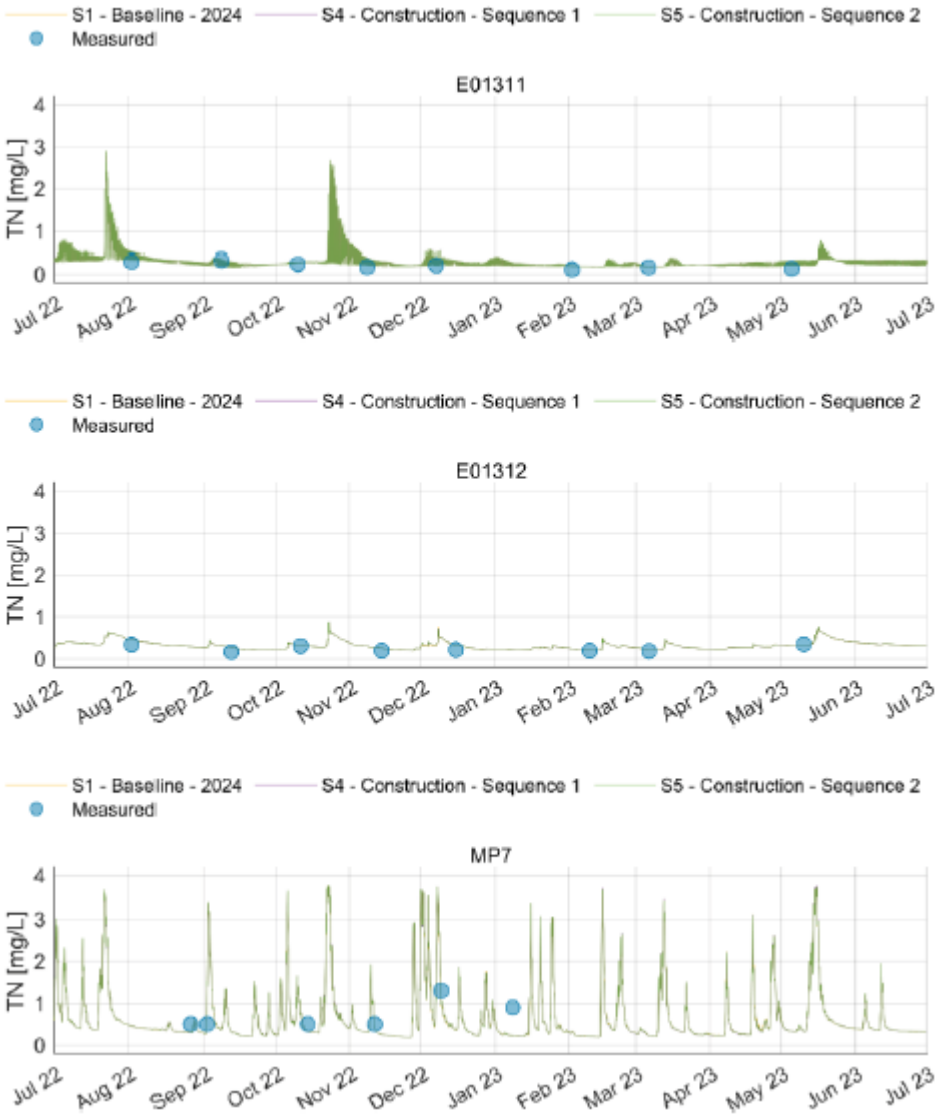

Figure 4 Total Nitrogen comparison timeseries plots for construction scenarios

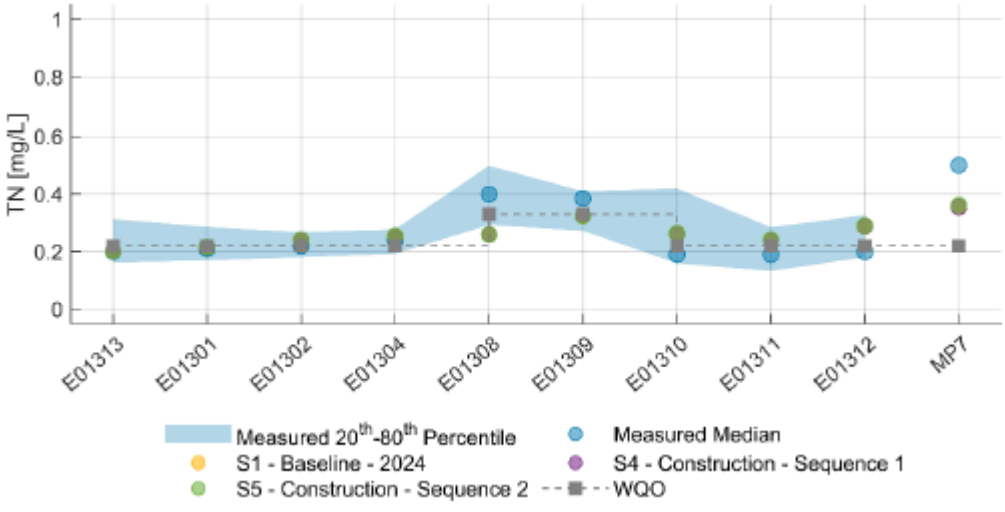

Figure 5 Total Nitrogen comparison band plot for construction scenarios

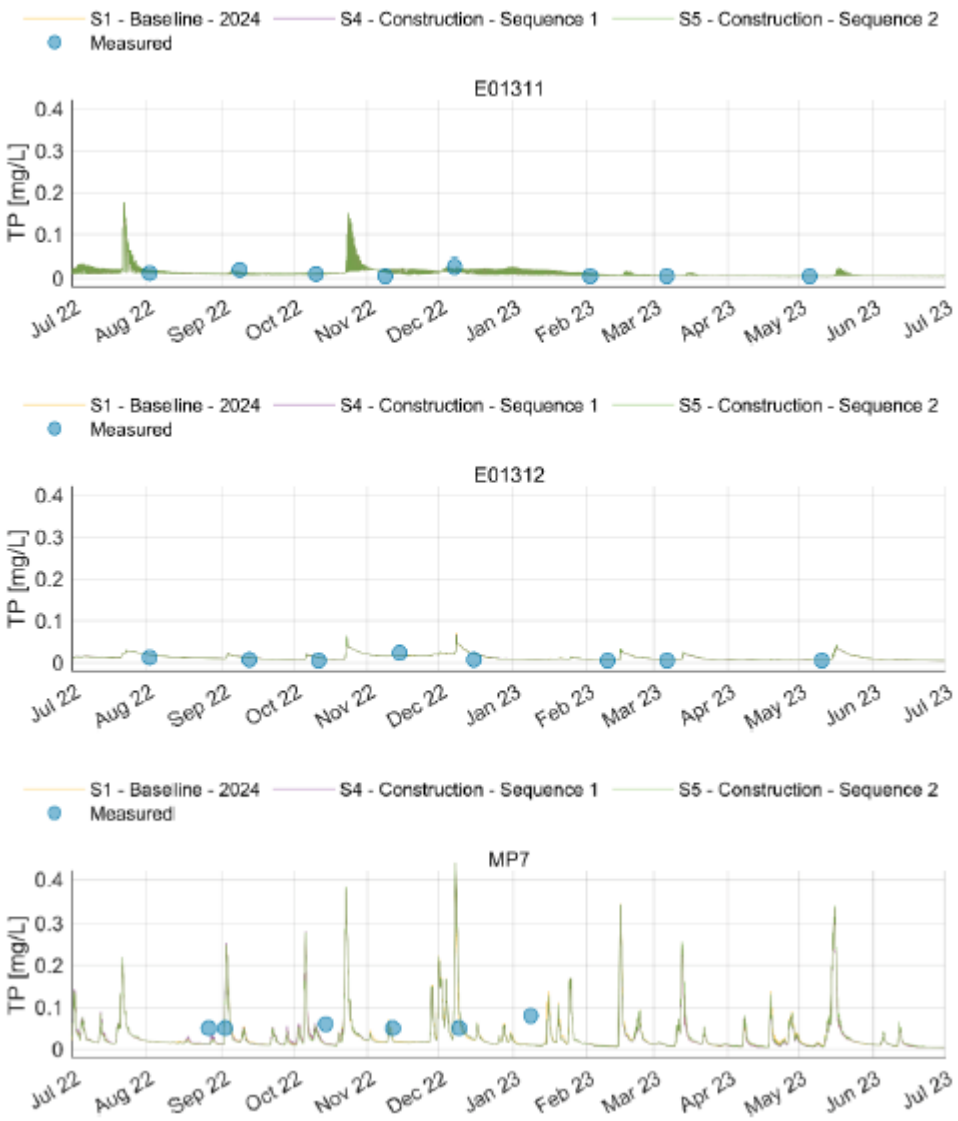

Figure 6 Total Phosphorus comparison timeseries plots for construction scenarios

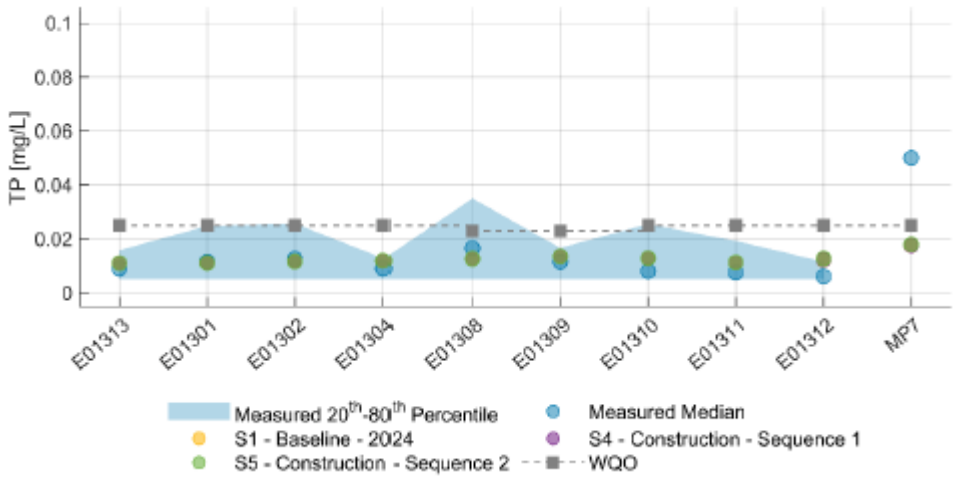

Figure 7 Total Phosphorus comparison band plots for construction scenarios

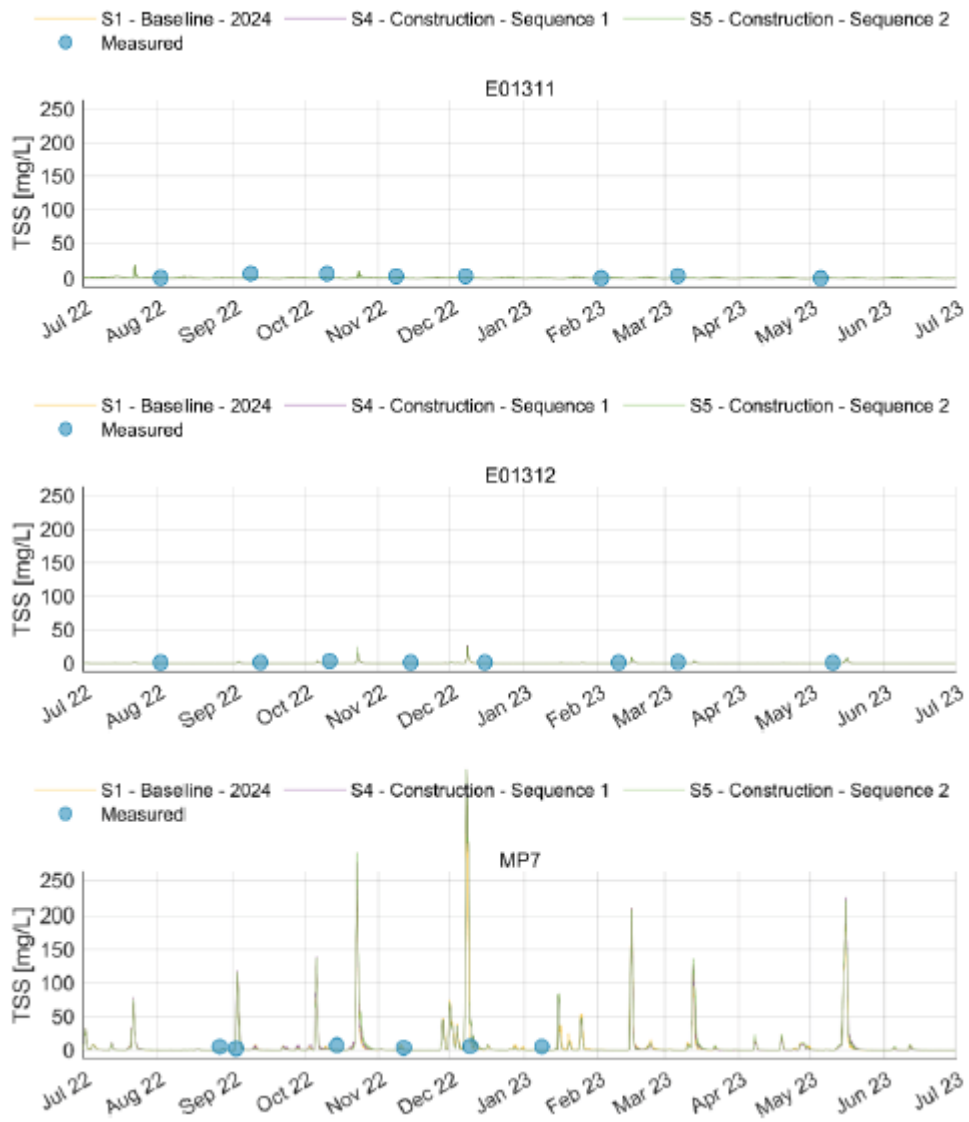

Figure 8 TSS comparison time series plots for construction scenarios

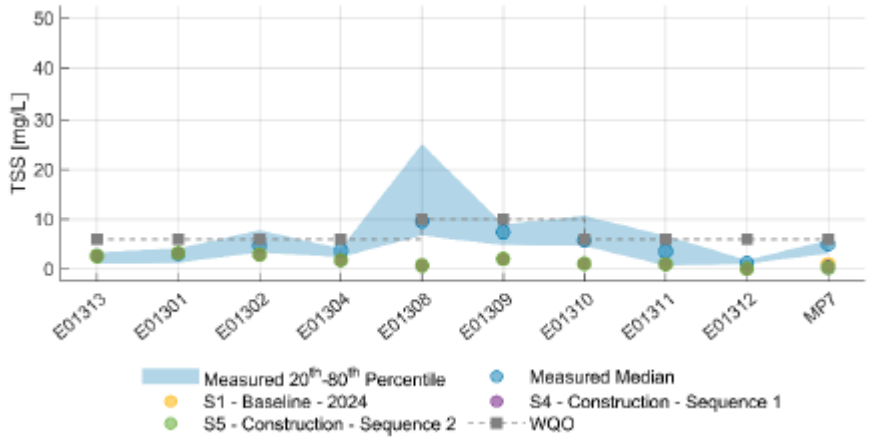

Figure 9 TSS comparison band plots for construction scenarios

Appendix F.2 – Operational phase – TUFLOW FV modelling

Results from the TUFLOW FV modelling of operational scenarios as presented in Figure 10 to Figure 19 for each of salinity, DO, TN, TP and TSS. As shown, there is no discernible change between baseline and operations scenarios across all sites (i.e. lines overlay each other) (Water Technology 2025).

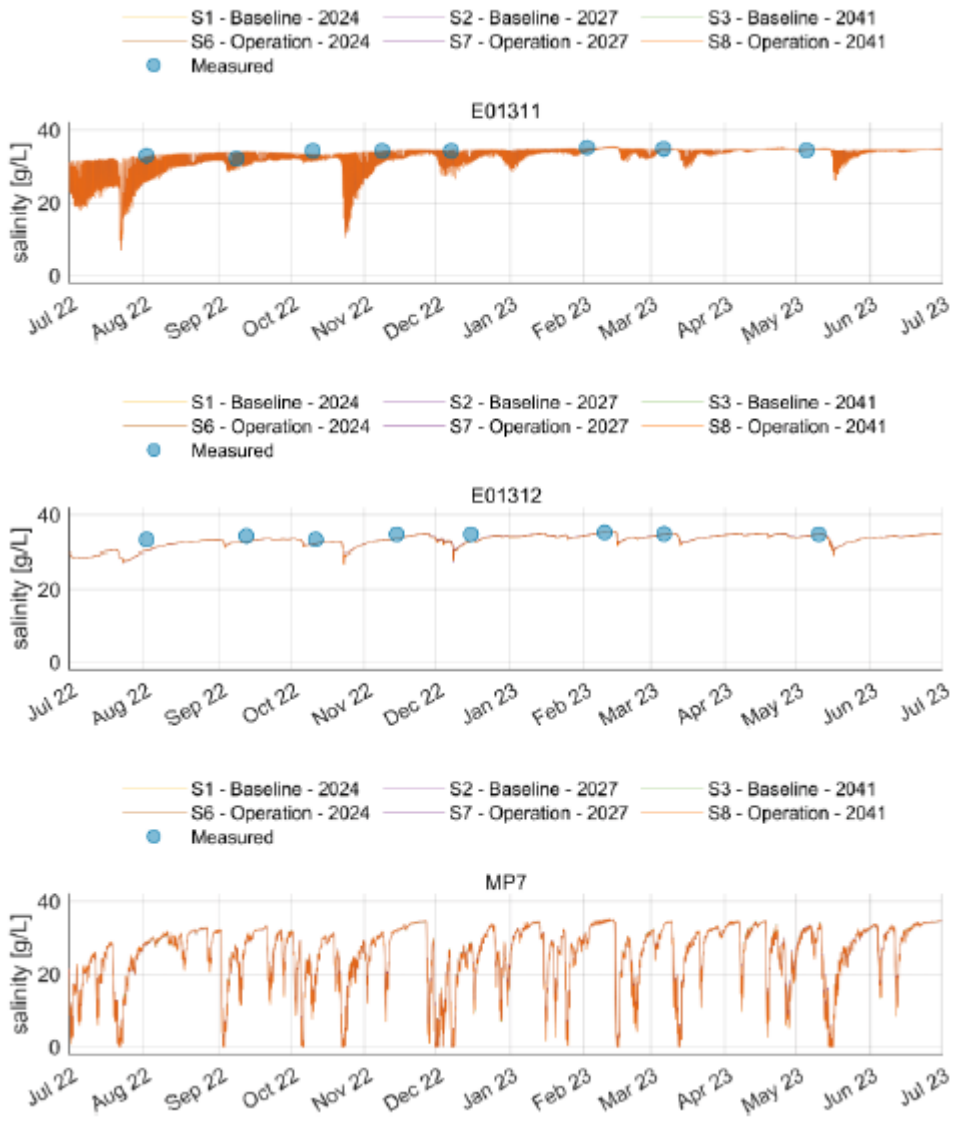

Figure 10 Salinity comparison timeseries plots for operation scenarios

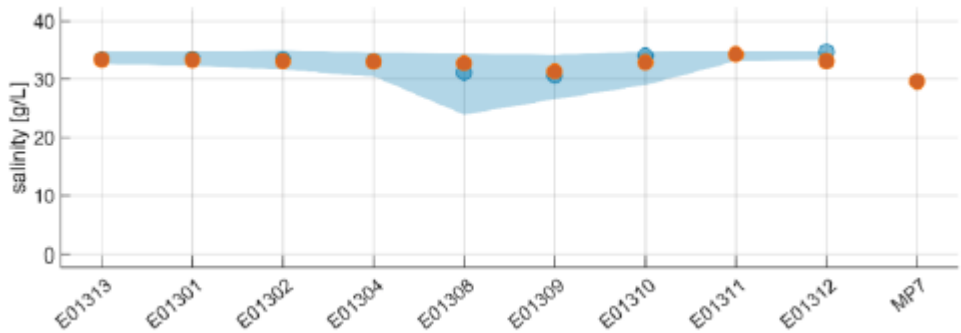

Figure 11 Salinity comparison band plots for operation scenarios

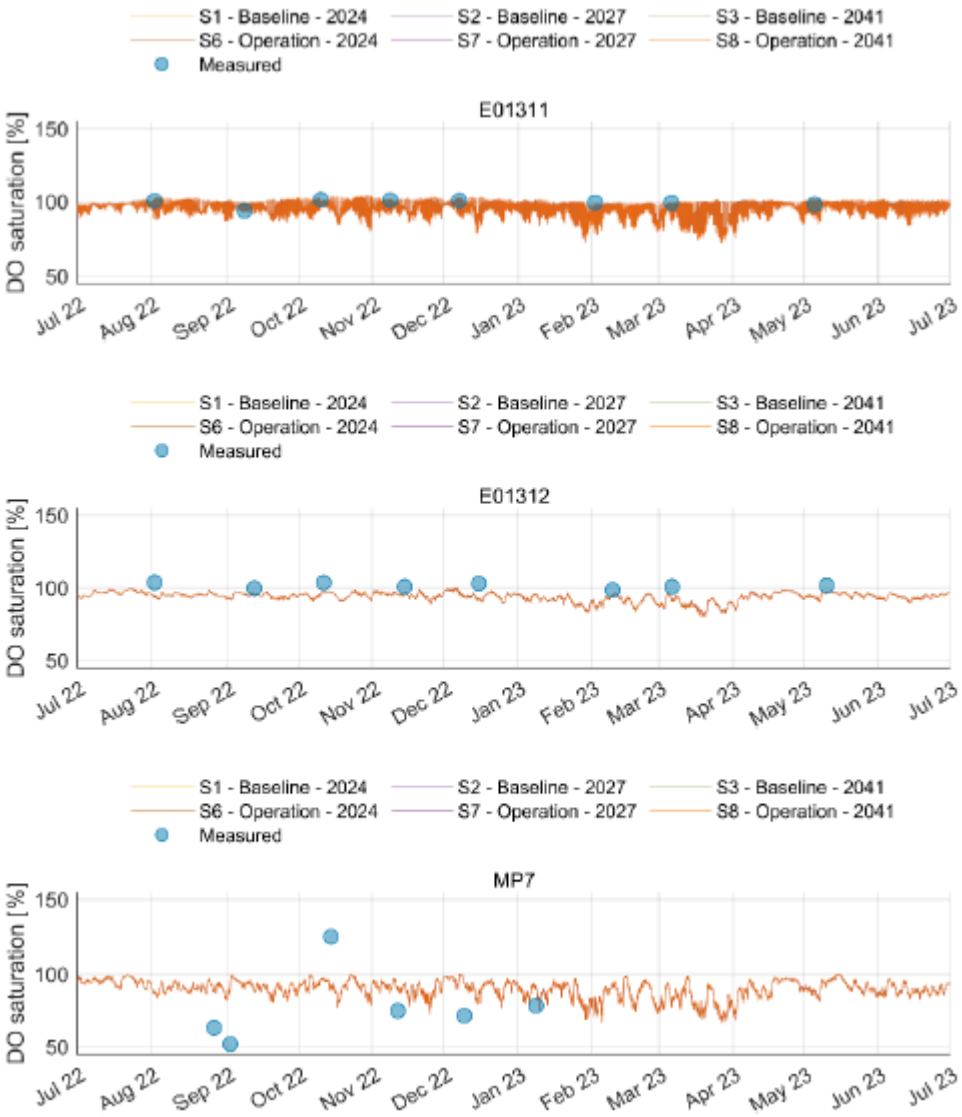

Figure 12 Dissolved oxygen comparison timeseries plots for operation scenarios

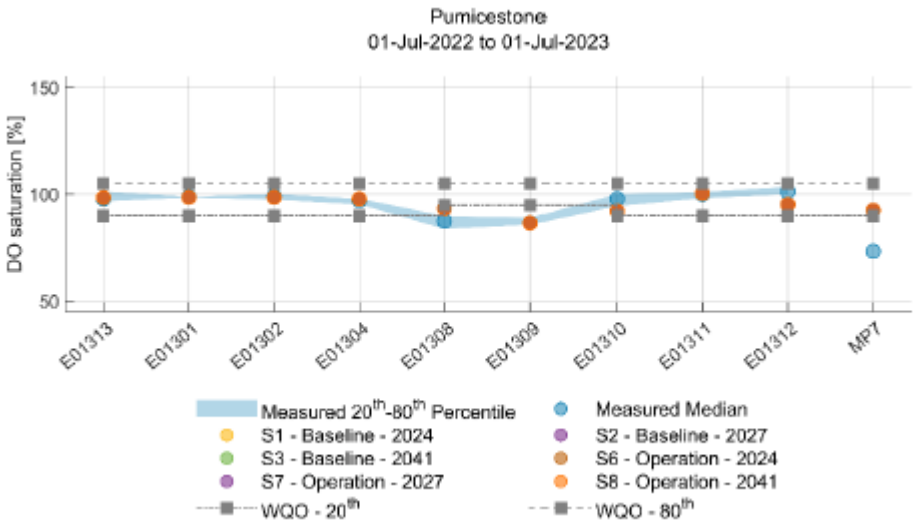

Figure 13 Dissolved oxygen comparison band plots for operation scenarios

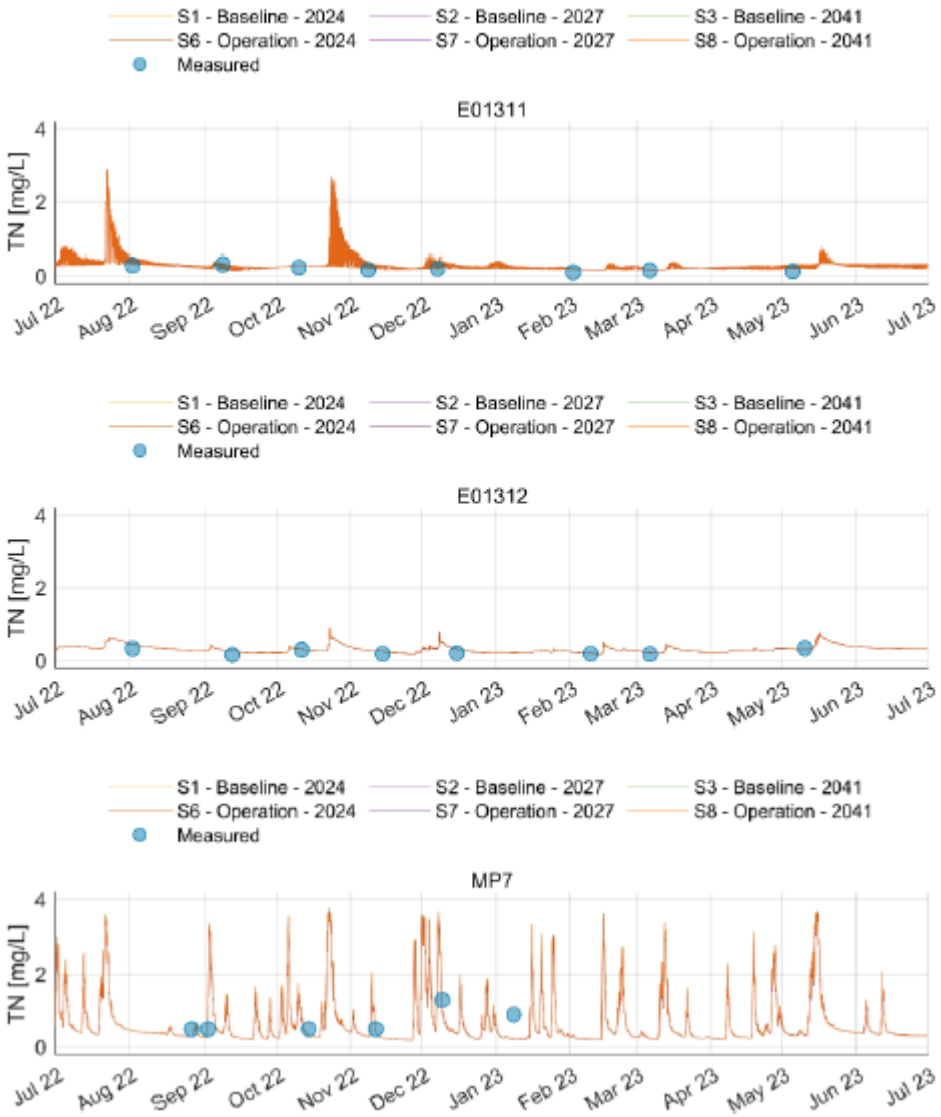

Figure 14 Total Nitrogen comparison timeseries plots for operation scenarios

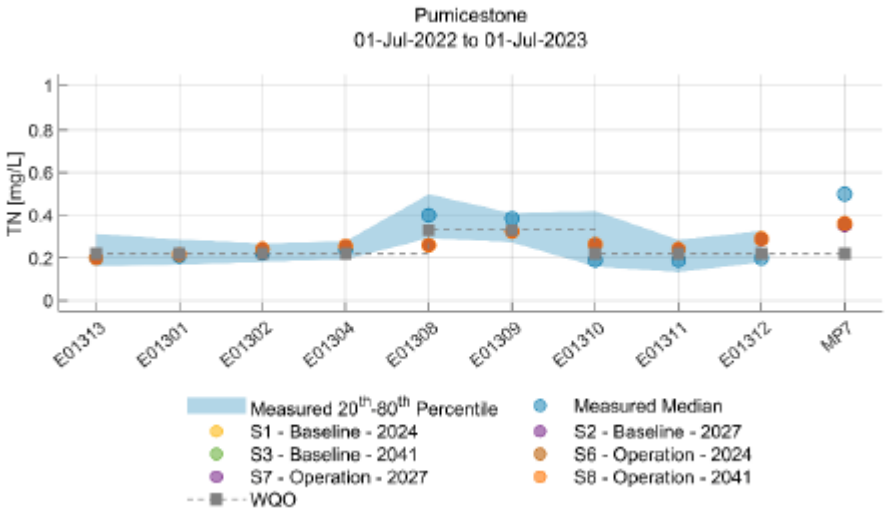

Figure 15 Total Nitrogen comparison band plots for operation scenarios

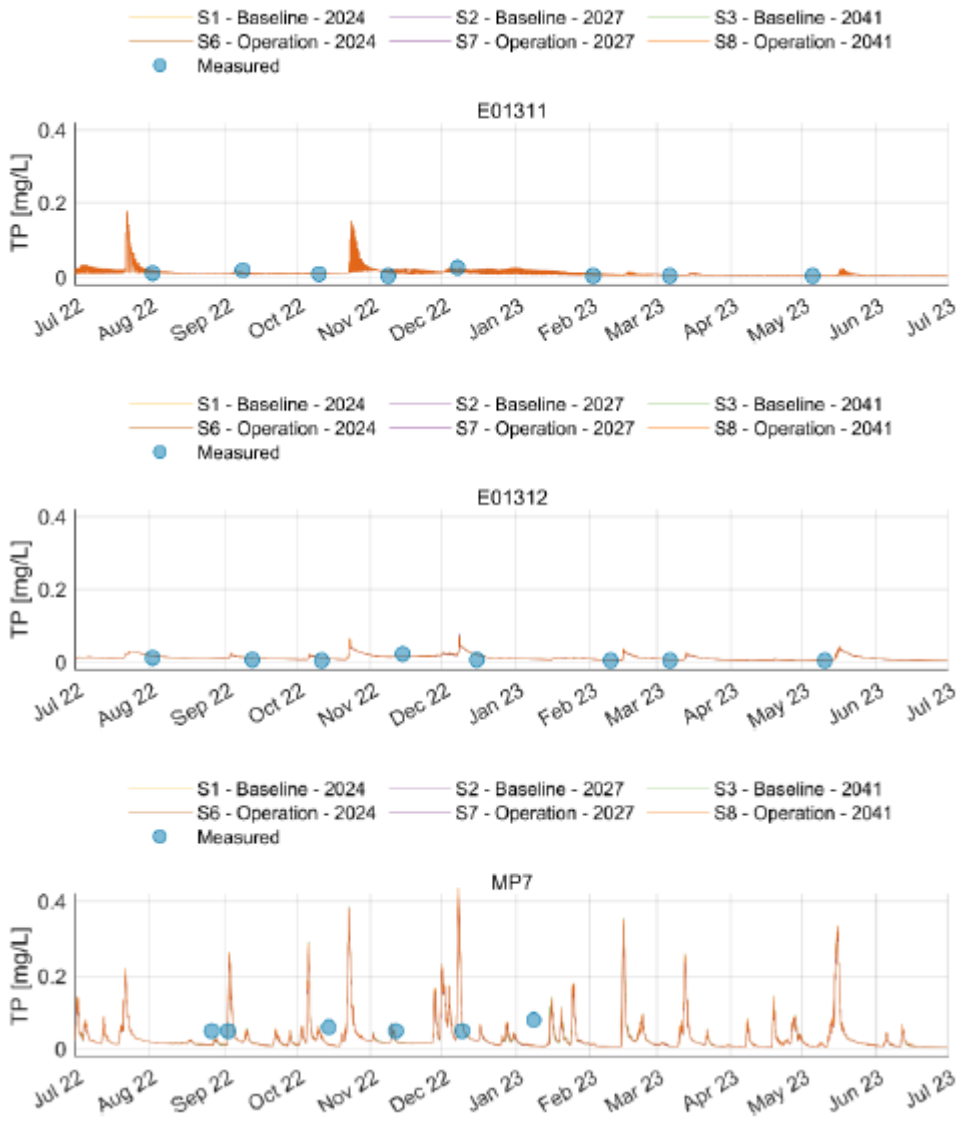

Figure 16 Total Phosphorus timeseries plots for operation scenarios

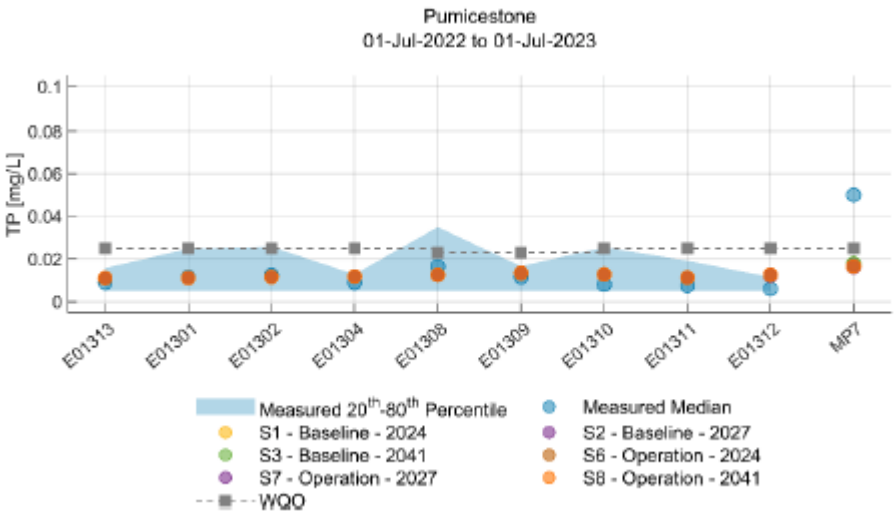

Figure 17 Total Phosphorus comparison band plots for operation scenarios

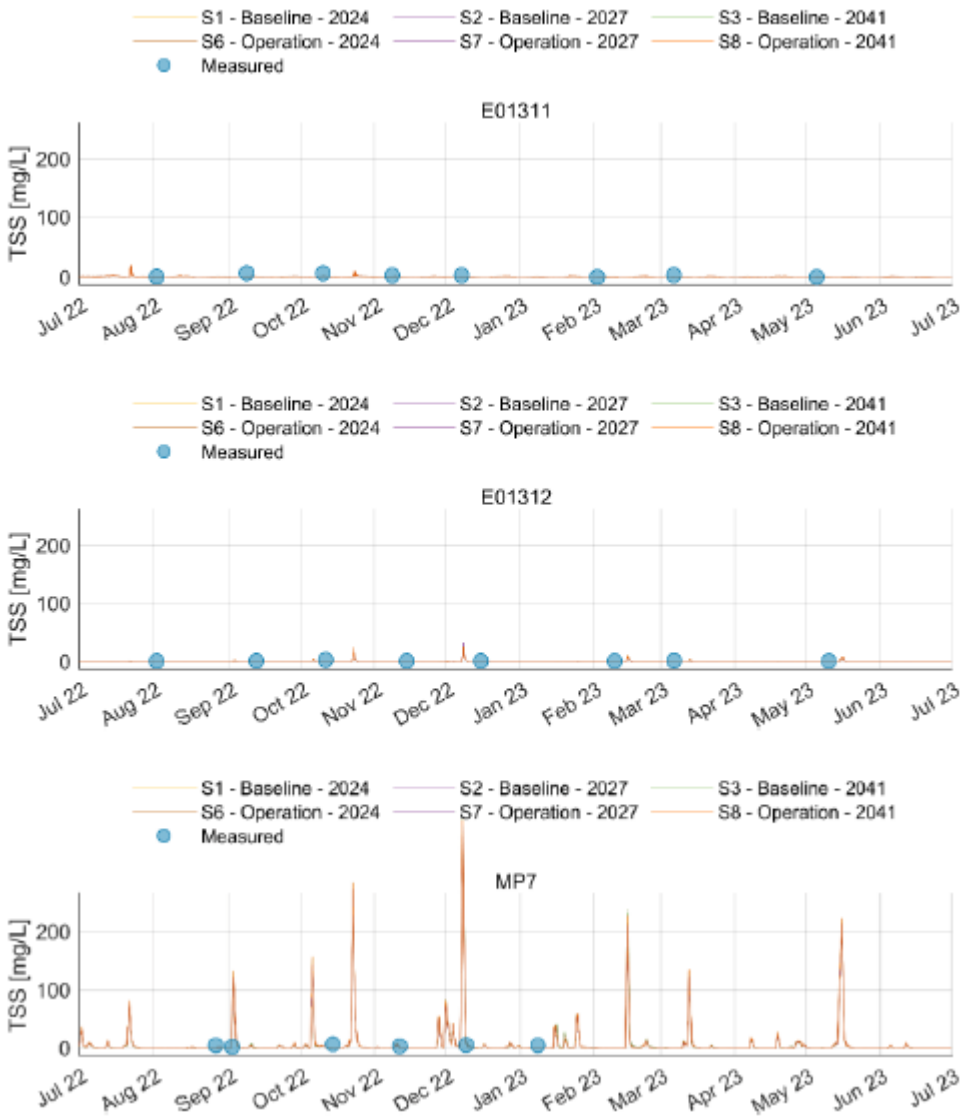

Figure 18 TSS comparison timeseries plots for operation scenarios

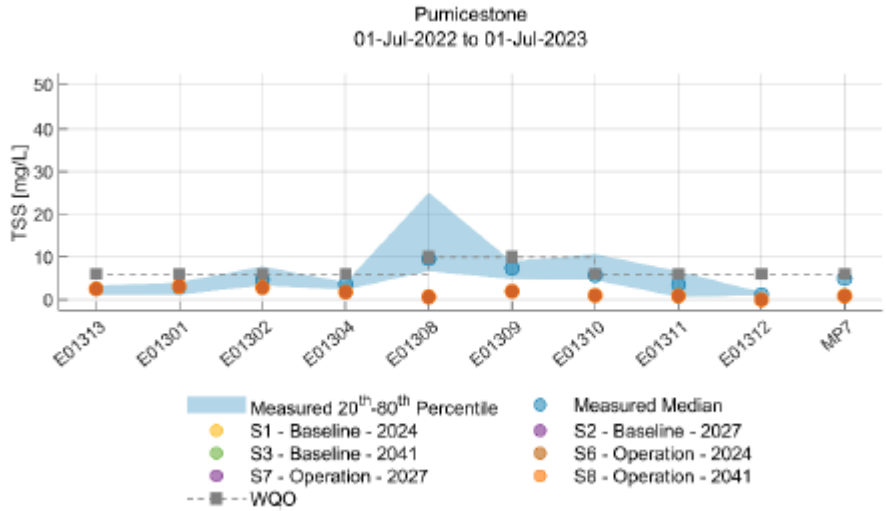

Figure 19 TSS comparison band plots for operation scenarios

Appendix F.3 – Dilution mapping – Baseline (2024) and Operational (2024) scenarios

5th percentile dilution maps for the baseline (pre-construction) 2024 and operational 2024 scenarios are shown in Figure 20 to Figure 23. In these plots, the extent of dilutions less than 1:10 and 1:50 are shown. Similarly, 0th percentile minimum dilutions are shown in Figure 24 to Figure 27 (Water Technology 2025).

Figure 20 5th Percentile 1:10 dilution extent for baseline (pre-construction) scenario 2024

Figure 21 5th Percentile 1:10 dilution extent for operational scenario 2024

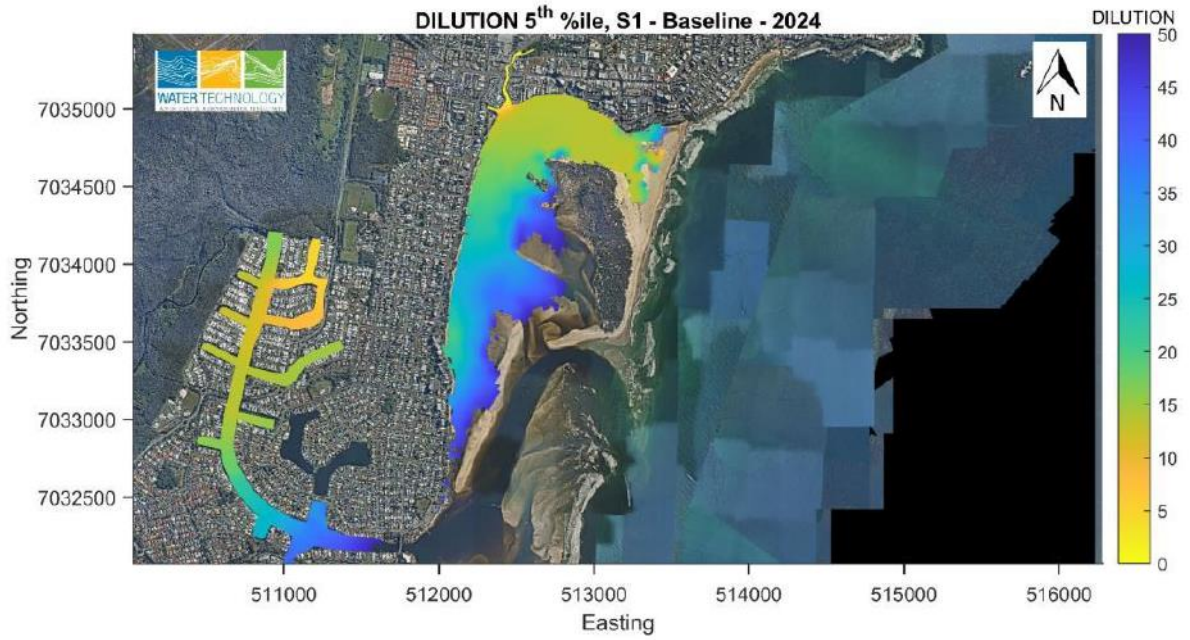

Figure 22 5th Percentile 1:50 dilution extent for baseline (pre-construction) scenario 2024

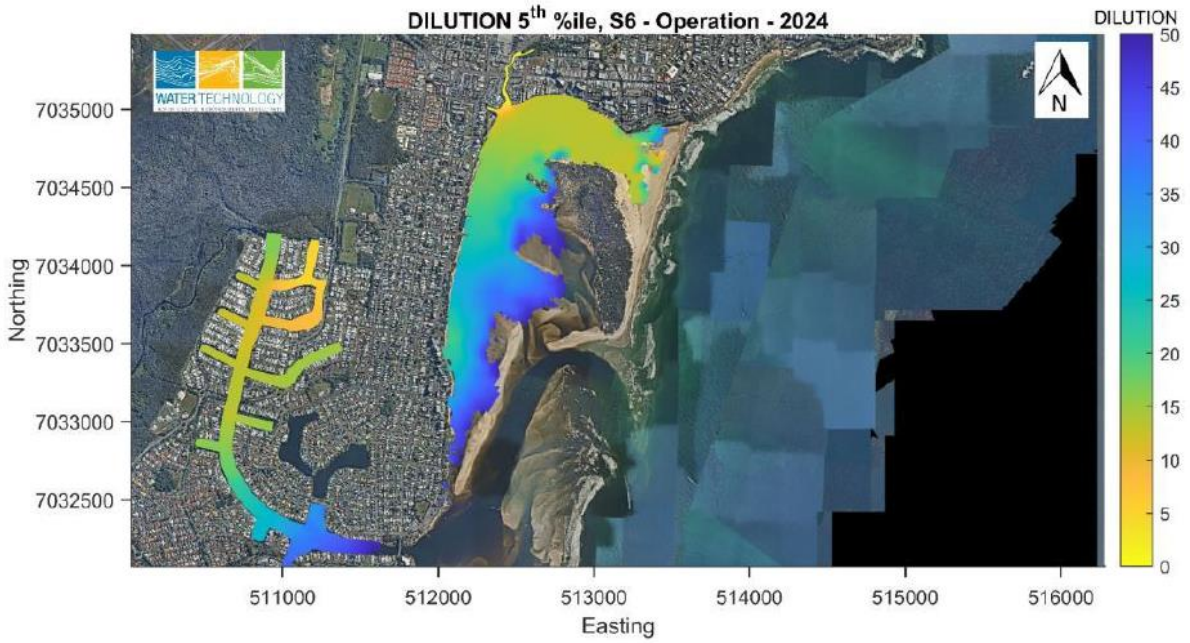

Figure 23 5th Percentile 1:50 dilution extent for operational scenario 2024

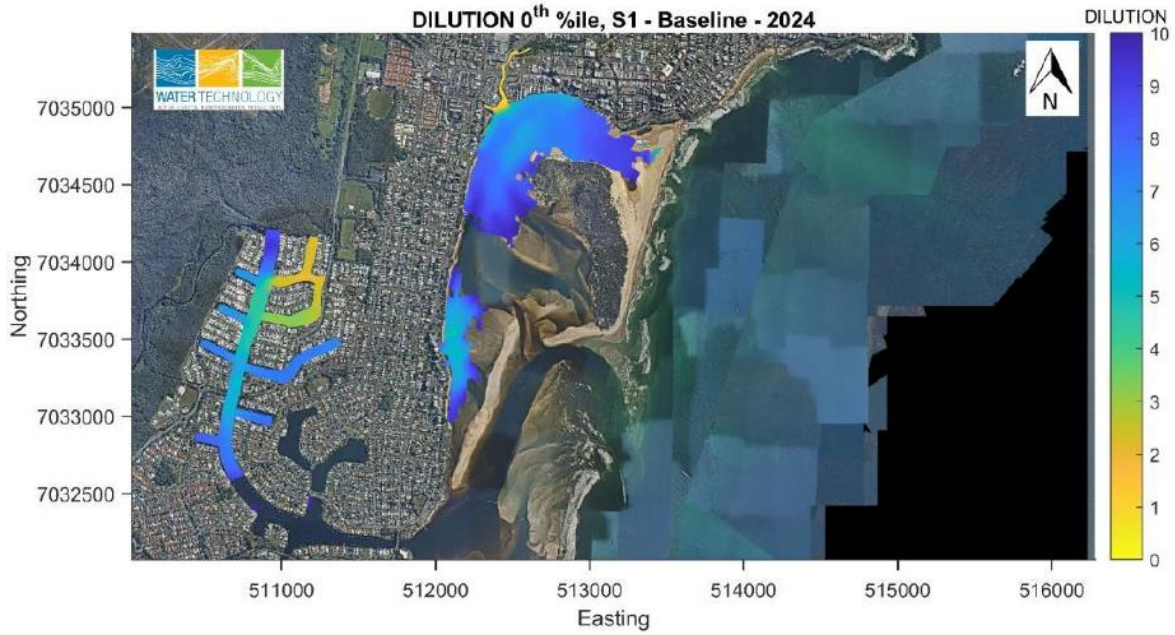

Figure 24 0th Percentile 1:50 dilution extent for baseline (pre-construction) scenario 2024

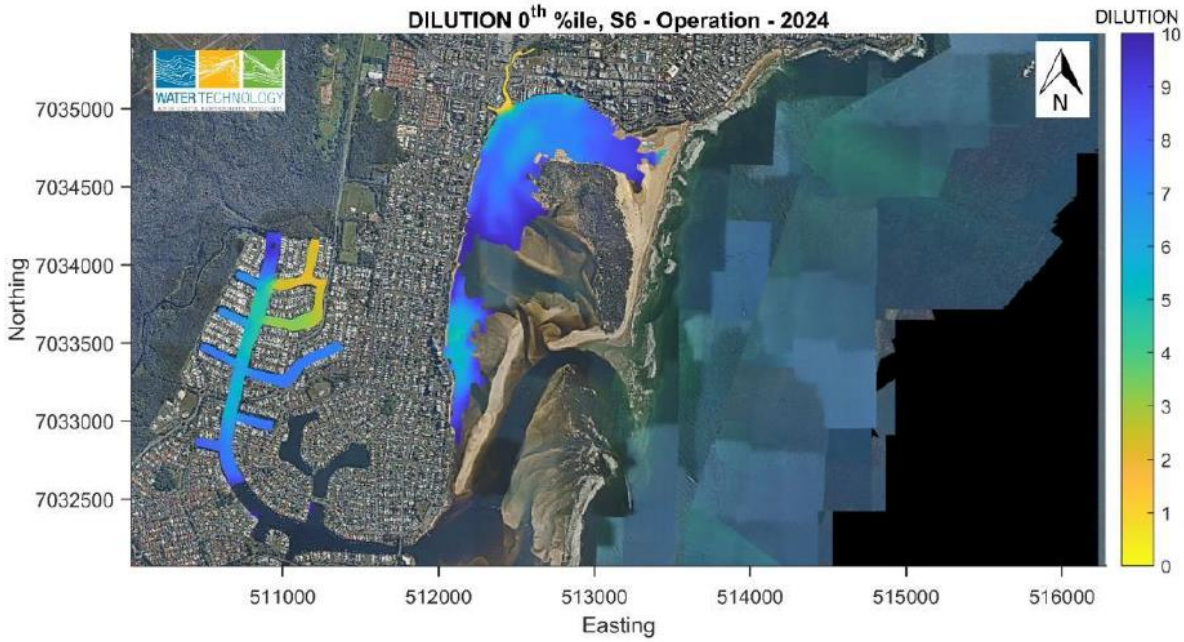

Figure 25 0th Percentile 1:50 dilution extent for operational scenario 2024

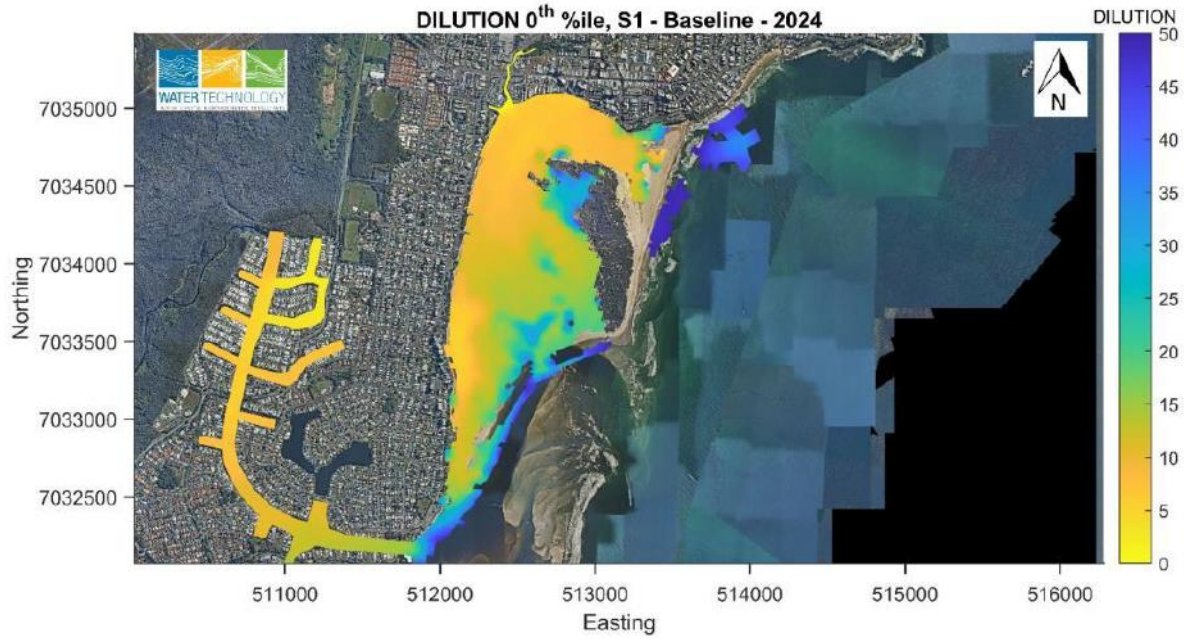

Figure 26 0th Percentile 1:50 dilution extent for baseline (pre-construction) scenario 2024

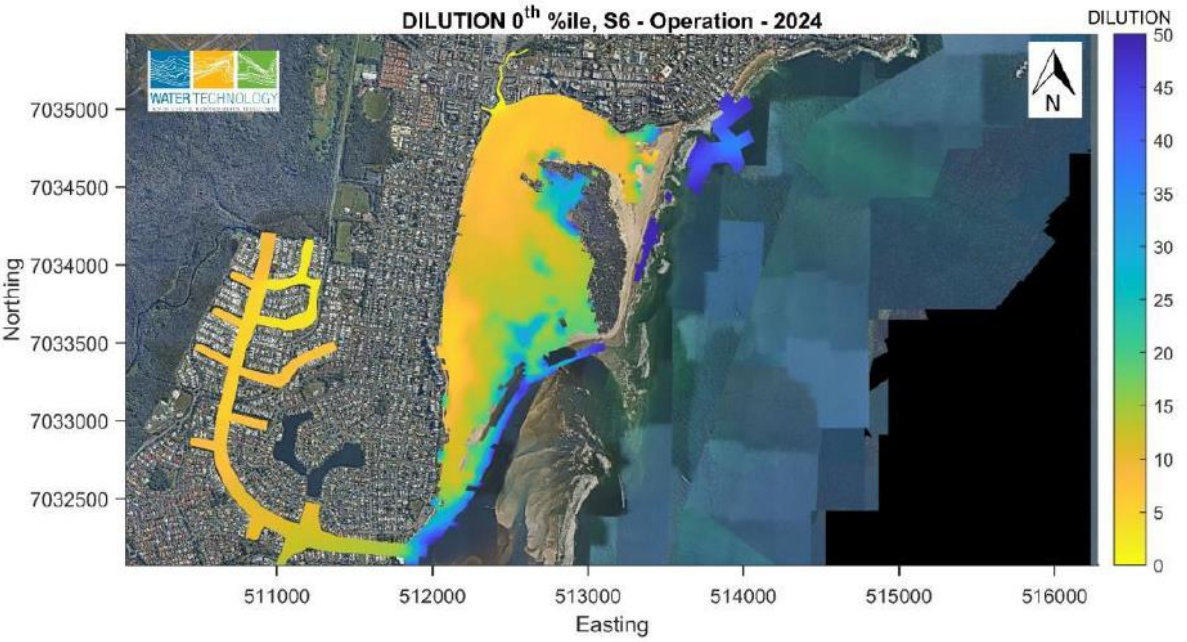

Figure 27 0th Percentile 1:50 dilution extent for operational scenario 2024

Appendix F.4 – Water quality risk assessment

The following presents a summary of the water quality risk analysis and outcomes undertaken by Water Technology (2025), informed by the outputs of the water quality modelling.

Risk assessment framework

The risk assessment framework was based on a risk matrix considering a likelihood rating, consequence rating, and risk management options as summarised in Table 1 to Table 4.

Table 1 Risk matrix

Likelihood	Severity of Consequence				
	Insignificant	Minor	Moderate	Major	Extreme
Almost Certain	Moderate	High	High	Extreme	Extreme
Likely	Low	Moderate	High	High	Extreme
Possible	Low	Moderate	Moderate	High	Extreme
Unlikely	Low	Low	Moderate	High	High
Rare	Low	Low	Low	Moderate	High

Table 2 Risk likelihood rating

Likelihood category	Probability of occurrence
Almost Certain	This risk event is expected to occur in most circumstances
Likely	This risk event will probably occur in most circumstances
Possible	This risk event could occur at some time
Unlikely	This risk event will probably not occur in most circumstances
Rare	This risk event may only occur in exceptional circumstances

Table 3 Risk consequence rating

Consequence Category	Consequence
Insignificant	No detrimental effect on the environment.
Minor	Short-term detrimental effect on the environment.
Moderate	Serious discharge of pollutant into the waterway.
High	Long-term detrimental environmental impact (i.e., chronic and/or significant discharge of pollutant.
Extreme	Extensive detrimental long-term impacts on the environment (i.e., catastrophic and/or extensive discharge of persistent hazardous pollutant.

Table 4 Risk treatment/management response

Risk Rating	Risk Category	Risk Treatment
	Low	**No major concern**: Risks inherently assessed as being low, risk will be tolerated subject to Management review. Management responsibility must be defined. Control evaluation where appropriate. Manage through routine procedure.
	Moderate	**Periodic monitoring**: Risks inherently assessed as being moderate, risk may be tolerated subject to Management review. Ensure system and processes controls such that the risk is as low as is reasonably practicable and that due diligence systems are established so that appropriate corporate governance processes can be demonstrated to be in operation.
	High	**Control critical**: Risks inherently assessed as being high, risk may be tolerated subject to EMT review. Ensure system and technical controls such that the risk is as low as is reasonably practicable and that due diligence systems are in place and corporate governance can be demonstrated.
	Extreme	**Active management:** Risk inherently assessed as being extreme, risk will not be tolerated and must be escalated to the Council and/or EMT. If risk cannot be reduced from Active Management, management must demonstrate that due diligence systems are in place and corporate governance can be demonstrated.

Identified risks and proposed mitigation measures

Table 5 summarises the identified risks based on modelling results and experience in similar projects, together with associated risk categorisation and proposed mitigation measures for the design, construction and operational phases (Water Technology 2025).

Table 5 Identified risks and proposed mitigation measures

Hazard Description	Consequences of Hazard Occurring	Unmitigated Likelihood Rating of Risk Occurring	Unmitigated Consequence Rating of Risk Occurring	Unmitigated Risk Rating	Mitigation Measures	Mitigated Likelihood Rating of Risk Occurring	Mitigated Consequence Rating of Risk Occurring	Mitigated Risk Rating	Comments
Acute impacts from sediments due to the CTCU operation (arising of inaccurate modelling assumptions, poor design, etc.)	Change of ecological character of Pumicestone Passage and impact to its EVs	Unlikely	Moderate	Moderate	Best practice design and modelling guidelines were used in the preparation of the models. Best practice erosion and sediment control is to be implemented Ensure CTCU stormwater treatment assets are well maintained	Rare	Moderate	Low	*Modelling has indicated very minor chronic changes due to CTCU alone*
Acute impacts from nutrient/sediments due to the CTCU construction from designed rainfall events, inaccurate modelling assumptions	Eutrophication /algal blooms in Pumicestone Passage	Possible	Major	High	Best practice design and modelling guidelines were used in the preparation of the models. Modelling indicates that acute impacts would be rare. Best practice erosion and sediment control is to be implemented for construction phase. Follow EMP actions (monitoring and procedures)	Rare	Moderate	Low	*Early intervention may avoid issues becoming chronic/major*
Acute impacts from toxicants due to the CTCU operation e.g. hydrocarbon spill	Impacts on fish and other biota	Possible	Major	High	Ensure spill management plans are in place and sufficient training and procedures are in place to swiftly enact them.	Unlikely	Minor	Low	*Modelling has indicated very minor chronic changes due to CTCU alone*
Acute impacts from toxicants due to the CTCU construction - i.e., from disturbance of Acid Sulfate Soils; hydrocarbon spills; stormwater treatment failure; excessive litter release	Impacts to amenity / aesthetic / recreational values (decline in ecosystem value)	Possible	Major	High	Ensure modelling is based on robust and credible science, according to industry modelling principles and existing guidelines where available, and that are adequately QA/QC'ed	Rare	Moderate	Low	*Early intervention may avoid issues becoming major*
Chronic (nutrient) impacts due to poor SW treatment design/malfunction/inaccurate modelling assumptions	Eutrophication of/algal blooms in Pumicestone Passage	Unlikely	Major	High	Best practice design guidelines and experienced professionals were employed to design and construct the stormwater management measures. The tidal areas of Pumicestone passage have a lot of water movement. Modelling shows that the changes in volumes resulting from CTCU are insignificant. Follow EMP actions (monitoring and procedures)	Rare	Moderate	Low	*Early intervention may avoid issues becoming chronic/major*

Hazard Description	Consequences of Hazard Occurring	Unmitigated Likelihood Rating of Risk Occurring	Unmitigated Consequence Rating of Risk Occurring	Unmitigated Risk Rating	Mitigation Measures	Mitigated Likelihood Rating of Risk Occurring	Mitigated Consequence Rating of Risk Occurring	Mitigated Risk Rating	Comments
Chronic (toxicants) impacts due to CTCU operation (working as per design)	Change of ecological character of Pumicestone Passage and impact to its EVs	**Unlikely**	**Major**	**High**	Models are currently unable to model heavy metals. High levels of zinc and aluminium were present in baseline monitoring. **Ensure CTCU stormwater treatment assets are well maintained.**	**Possible**	**Major**	**High**	*Based on model results and literature review indicating traffic should not change contaminant loading*